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THE MEASUREMENT AND UTILIZATION OF BRAIN POWER IN THE ARMY[1]

History of Psychological Service.—The psychologists of America, of whom upward of two hundred served in the Army or Navy, have rendered conspicuously important assistance to the government in organizing an efficient fighting machine. Chief among the civilian agencies responsible for the development of this new and unexpectedly significant variety of service are the American Psychological Association and the Psychology Committee of the National Research Council. Nearly a score of committees or subcommittees of these organizations functioned during the military emergency.

Within the Army three principal groups of psychologists appear: one attached to the Office of The Adjutant General of the Army (specifically known as the Committee on Classification of Personnel in the Army), another in the Office of the Surgeon General of the Army (known as the Division of Psychology of the Medical Department), and a third in the Division of Military Aeronautics (the Psychological Section of the Medical Research Board). Although the several tasks of these groups of psychologists differed markedly, the primary purpose of each was the increase of military efficiency through improved placement with respect alike to occupational and mental classifications.

[1] Published with the approval of the Surgeon-General of the Army, from the Section of Psychology, Office of the Surgeon-General, Major Robert M. Yerkes, Chief.

Psychological service was rendered also to the following divisions or departments in addition to those named above: (1) the Morale Branch of the General Staff, (2) the Division of Military Intelligence, (3) the Committee on Education and Special Training of the War Department, and (4) the Chemical Warfare Service.[2]

Early in the emergency it became clear to psychologists in the military service that the fundamental psychological problem of the army is one of placement and that the most important service psychologists could possibly render would be to assist in so assigning every soldier that his mental (as well as physical) ability should be used to advantage. It was assumed by the psychological personnel that intelligence, alertness, the will to win, enthusiasm, faith, courage and leadership are even more important than are physical strength and endurance, and that this fact must be scientifically reckoned with wherever a strong military organization is to be built quickly. Very promptly it became the recognized purpose of army psychologists to assist in winning the war by the scientific utilization of brain power. The achievement of this purpose necessitated the preparation of special methods of mental measurement in order that recruits should be properly classified for elimination or assignment to military training.

The army, at first naturally and wisely skeptical concerning the practical values of psychological service and inclined to anticipate research instead of service, shortly achieved a new point of view and opinion. Skepticism was replaced in some directions gradually, elsewhere rapidly, by faith in the practicability and immediate value of various kinds of psychological work and eagerness for its continuation and extension. In the end the psychological personnel of the army was completely swamped by requests, demands and orders for help. Scores of telegrams and letters from commanding officers testify to their hearty appreciation of efforts towards scientific placement within the army and their desire for the introduction or furtherance of psychological service in various departments or organizations.

Skeptics, of course, still exist and there are inevitable misunderstandings and prejudices, but the data at hand indicate that at least seventy-five per cent. of the officers of the United States Army have been won by actual demonstration of values and first hand acquaintance with psychological service to its hearty support.

It is extremely important to emphasize at the outset that this article deals with only one of the several important lines of psychological military service, that, namely, of the Division of Psychology of the Medical Department.

Purposes of Mental Examining.—As originally conceived, psychological service within the Medical Department was to assist medical officers, and especially neuropsychiatric officers, in discovering and eliminating men who are mentally unfit for military duty. It appeared, prior to actual trial, that reasonably well planned methods of mental measurement should enable psychological examiners to discover mentally inferior recruits as soon as they arrived in camp and to make suitable

[2] For the United States Navy serviceable methods of selecting, placing and training gunners, listeners and lookouts were devised and developed by Lieutenant Commander Raymond Dodge. The methods prepared by Dr. Dodge as well as certain instruments designed by him for naval use have been extensively and profitably used, and the appointment of this psychologist as Lieutenant Commander in the Naval Reserve is at once a fitting recognition of his practical service and an indication of the appreciation of his work by the officers with whom he has been associated.

recommendation concerning them to the medical offcer. It was also believed that psychologists could assist neuro-psychiatrists in the examination of psychotic individuals. The proposed rôle of the psychologist then was that of assistant to the army surgeon: the actual rôle, as a result of demonstration of values, was that of expert in scientific personnel work.

In interesting contrast with the original purpose of mental examining, as stated above, stands the following account of the purposes actually achieved by this service: (1) The assignment of an intelligence rating to every soldier on the basis of systematic examination; (2) the designation and selection of men whose superior intelligence indicates the desirability of advancement or special assignment; (3) the prompt selection and recommendation for development battalions of men who are so inferior mentally as to be unsuitable for regular military training; (4) the provision of measurements of mental ability which shall enable assigning officers to build organizations of uniform mental strength or in accordance with definite specifications concerning intelligence requirements; (5) the selection of men for various types of military duty or for special assignments, as for example, to military training schools, colleges or technical schools; (6) the provision of data for the formation of special training groups within the regiment or battery in order that each man may receive instruction suited to his ability to learn; (7) the early discovery and recommendation for elimination of men whose intelligence is so inferior that they can not be used to advantage in any line of military service.

Although it originally seemed that psychological examining naturally belonged in the Medical Department of the Army and would there prove most useful, it subsequently became evident that this is not true because the service rendered by psychological examiners is only in part medical in its relations and values. In the main its significance relates to placement and its natural affiliation is with military personnel. For practical as well as logical reasons it would doubtless have been wiser had the service of the Division of Psychology been associated from the first with that of the Committee on Classification of Personnel in the Army, so that the psychological as well as occupational, educational and other important data might have been assembled by a single military agency and promptly rendered available for use in connection with the assignment of recruits. Thus also the organization of a special branch of the General Staff or of a Personnel Section of the Adjutant General's Office to deal with varied problems of military personnel might have been hastened and otherwise facilitated and the utilization of brain power as contrasted with man power in the ordinary sense rendered more satisfactory early in the emergency.

Methods of Measuring Intelligence.—The committee of psychologists originally organized to prepare and test methods of psychological examining for the army promptly decided that it would be desirable to examine *all* recruits in order to provide an intelligence rating for every soldier. This decision necessitated the development of methods which could be administered to relatively large groups and in addition the selection of procedures which could be used for the more careful examination of individuals.

Most of the methods which were recommended to the military authorities in the summer of 1917 have since that time been repeatedly revised and improved in the light of results. The procedures finally

adopted and in use throughout the army during the past few months differ radically from those originally recommended. They may be described summarily as follows:

There are four principal systems or stages in the examination. First comes the procedure of segregation, by means of which the original group, which may, if examining rooms permit, include as many as five hundred men, is split into two subgroups; (*a*) the literates, men who can speak and read English fairly well, and (*b*) the illiterates, men who are relatively unfamiliar with the English language. These two groups must necessarily be treated somewhat differently, therefore the literates are given a group examination known as Alpha, which consists of eight markedly different tests. This examination, although it requires almost no writing on the part of the subject, does demand facility in using written and oral instructions. The illiterate group is given an examination known as Beta, which is in effect Alpha translated into pictorial form. In this examination pantomime and demonstration supplant written and oral instructions.

Each group examination requires approximately fifty minutes. Subjects who fail in Alpha are ordinarily given opportunity to improve their ratings by taking Beta, and subjects who fail in Beta are given individual examination in order that they may be more accurately and justly rated than in the group examination alone.

Any particular individual may have to take one, two or three of these types of examination, thus for example, a man of low grade literacy who happens to get into examination Alpha may also have to take Beta and some form of individual examination.

Examination papers for both Alpha and Beta are scored rapidly by the use of stencils and the resulting rating is promptly reported to the appropriate military authority.

By means of this system of examinations it is possible for an examining staff consisting of four psychologists and a force of scoring clerks to examine as many as one thousand men per day.

Every man examined by one or more of the procedures described is assigned a numerical rating and in addition a letter grade which indicate his general intellectual ability or mental alertness. The numerical rating is used only for statistical purposes, the letter grade for practical military purposes. The latter alone is reported ordinarily to military officers and recorded on the soldier's service record and qualification card.

The letter grades which are in use are defined as follows: A designates very superior intelligence; B, superior intelligence; C+, high average intelligence; C, average intelligence; C—, low average intelligence; D, inferior intelligence; D—, very inferior intelligence. The letter E has been reserved for the designation of men whose mental ability is seemingly inadequate for regular military duty.

Commissioned officers usually possess and obviously should possess A or B intelligence. Many excellent non-commissioned officers possess C or C+ intelligence, but in the main this group is composed of men with C+ or B ratings. The great body of privates grades C. Men with D or D— intelligence are usually slow to learn and rarely gain promotion. Many of them, especially the D— individuals, can not be used to advantage in a military emergency which demands rapidity of training. The results of army mental testing indicate that the majority of D— and E soldiers are below ten years mental age. A few fall as low as three or four years.

The contrast between A and D — intelligence becomes impressive when it is shown that men of A intelligence have the requisite mental ability to achieve superior records in college or professional school, whereas D — individuals are rarely able to pass beyond the third or fourth grade of an elementary school, however long they may attend.

Reliability of Methods.—The methods of mental examining used in the army have been found to possess reliability as well as practical value which far exceeded the expectations of the men who are responsible for them. Indeed, the success of this particular methodological undertaking is a remarkable demonstration of the "fecundity of aggregation." It is extremely unlikely that any individual working alone would have developed within reasonable time equally valuable methods of group examining. Inasmuch as reliability is of first importance, various measures of the validity of the army mental tests are presented.

The probable error of an Alpha score is about five points. This is approximately one-eighth of the standard deviation of the scores for unselected soldiers. The reliability coefficient of examination Alpha approximates .95. This group examination correlates with other measures of mental ability as follows: (1) With officers' ratings of their men, .50 to .70 for the total Alpha score and .30 to .54 for the separate tests; (2) with Stanford-Binet measures of intelligence, .80 to .90 for the total Alpha score and .31 to .85 for the separate tests; (3) with the Trabue B and C Completion tests combined, .72 for the total score and .39 to .76 for the separate tests; (4) with Examination Beta, .80; (5) with the composite result of Alpha, Beta and Stanford-Binet examinations, .94; (6) in the case of school children results of Alpha examination correlate (*a*) with teachers' ratings .67 to .82, (*b*) with school marks .50 to .60, (*c*) with school grade location of thirteen and fourteen year old children .75 to .91, (*d*) with age of children .83 (for soldiers the correlation of Alpha score with age is practically zero).

The Alpha examination given with double the usual time allowance correlates approximately .97 with the regular time examination.

The following data indicate the reliability of Examination Beta: It correlates with Alpha, .80; with Stanford-Binet, .73; with the composite of Alpha, Beta and Stanford-Binet, .915. The correlation of the separate Beta tests with the Stanford-Binet ranges from .47 to .63 (average .58). Results of Beta given with double time allowance correlate with those obtained with the regular time allowance .95.

For the several forms of individual examination used in the army the principal correlations at present available are as follows:

Results obtained by repetition of Stanford-Binet examination of school children correlate .94 to .97. Results of one half of the scale compared with the other half correlate .94 to .96. An abbreviated form of the Stanford-Binet examination consisting of two tests per year was used extensively in the army. The results of this abbreviated scale correlate .92 with those obtained by use of the complete scale.

For the Point Scale examination the measures of reliability are practically the same as for the Stanford-Binet.

A Performance Scale examination prepared especially for military use consisted of ten tests. Results for the several tests of the scale correlate with Stanford-Binet results, .48 to .78. Five of the ten tests yield a total score which correlates .84 with the Stanford-Binet score. The same

five tests correlate .97 with the results of the entire scale.

Summary of Results.—After preliminary trial in four cantonments psychological examining was extended by the War Department to the entire army, excepting only field and general officers. To supply the requisite personnel, a school for training in military psychology was established in the Medical Officers' Training Camp, Fort Oglethorpe, Georgia. Approximately one hundred officers and more than three hundred enlisted men received training at this school.

The work of mental examining was organized finally in thirty-five army training camps. A grand total of 1,726,000 men had been given psychological examination prior to January 1, 1919. Of this number, about 41,000 were commissioned officers. More than 83,000 of the enlisted men included in the total had been given individual examination in addition to the group examination for literates, for illiterates, or both.

Between April 27 and November 30, 1918, 7,749 (0.5 per cent.) men were reported for discharge by psychological examiners because of mental inferiority. The recommendations for assignment to labor battalions because of low grade intelligence, number 9,871 (0.6 + per cent.). For assignment to development battalions, in order that they might be more carefully observed and given preliminary training to discover, if possible, ways of using them in the army, 9,432 (0.6 + per cent.) men were recommended.

During this same interval there were reported 4,744 men with mental age below seven years; 7,762, between seven and eight years; 14,566, between eight and nine years; 18,581, between nine and ten years. This gives a total of 45,653 men under ten years mental age. It is extremely improbable that many of these individuals were worth what it cost the government to maintain, equip and train them for military service.

The psychological rating of a man was reported promptly to the personnel adjutant and to the company commander. In addition, all low grade cases and men exhibiting peculiarities of behavior were reported also to the medical officer. The mental rating was thus made available for use in connection with rejection or discharge, the assignment of men to organizations and their selection for special tasks. The mental ratings were used in various ways by commanding officers to increase the efficiency of training and to strengthen organizations by improved placement.

It was repeatedly stated and emphasized by psychological examiners that a man's value to the service should not be judged by his intelligence alone, but that instead temperamental characteristics, reliability, ability to lead and to "carry on" under varied conditions should be taken into account. Even after the feasibility of securing a fairly reliable measure of every soldier's intelligence or mental alertness had been demonstrated, it remained uncertain whether these measurements would correlate positively with military value to a sufficient degree to render them useful. Data which have become available during the past year settle this question definitely by indicating a relatively high correlation between officers' judgments of military value and the intelligence rating.

The various figures which follow are presented not as a summary of the results of psychological examining in the army but instead as samples of these results, the chief value of which is to indicate their principal relationship and practical values.

(To be concluded.)

RADIUM PRODUCTION

DURING the period of the war, with no carnotite exports, the greatest part of the world's radium supply has been produced in the United States. The following table shows the radium output of the Standard Chemical Company of Pittsburgh, Pa., since 1913, at which time radium was first produced in the United States.

	Radium Element, Grams
1913	2.1
1914	9.6
1915	1.7
1916	5.0
1917	7.0
1918	13.6
	39.0

It is estimated that the total radium production in the United States to 1919 approximates 55 grams of radium element, and this represents, probably, more than half of all the radium produced in the world.

There has been some discussion lately by members of the Bureau of Mines as to the amount of radium that can be produced from the carnotite fields, as well as suggestions that mesothorium, a by-product from monazite, should replace radium in the luminous material which has found extensive use in the war on airplane and ship instrument dials, compasses, and many indicating devices, and which will find extensive use on watches and clocks, etc.

The estimates of Dr. Moore, of the Bureau of Mines, are based on a very inadequate study of the carnotite region made prior to the war and before the fields had been developed to any great extent. The carnotite holdings of the Standard Chemical Company, which are the largest under the control of a single company or individual and comprising about 350 claims, have been carefully studied —in part by systematic diamond drilling—and this work has been the basis for an estimate that at the least 500 grams of radium should be produced from carnotite. This is five times greater than Dr. Moore's estimate.

As regards mesothorium as a radium substitute, there are several points whose importance Dr. Moore and the Bureau of Mines have overlooked or minimized, in their anxiety to conserve radium. Statistics show that before the war considerably less than one thousand tons of monazite was worked up in the United States per annum in the production of thorium nitrate, and it is estimated that about three thousand tons of monazite supply the world's needs for thorium nitrate. Each ton of monazite containing about 5 per cent. of thoria (corresponding to good Brazilian concentrates) will yield about two milligrams of commercial mesothorium, so that per annum there may be expected a world's mesothorium production of about six grams. The cost of producing monazite will always prevent the production of mesothorium except as a by-product. Unlike radium, which has a half-decay period of 1,700 years and can be used in luminous material immediately after refining and for medical purposes after thirty days' aging, mesothorium has a comparatively brief half-decay period of 5.5 years and its economical use in luminous compound is only possible a year or two after refining. For medical purposes, the short life and varying gamma ray activity of mesothorium make this product less desirable than radium. The following table given by McCoy and Cartledge[1] shows the change in gamma-ray activity of pure mesothorium in time, due to the gradual decay of mesothorium I. (the parent product) and the increase and decrease of radiothorium, which produces thorium D with its very penetrating gamma rays.

THE CHANGE OF GAMMA RAY ACTIVITY OF MESOTHORIUM WITH TIME

Time in Years	Ms I	Th D	Total
0	1.000	0.000	1.000
1	0.881	0.489	1.370
2	0.777	0.781	1.558
3	0.685	0.935	1.620
4	0.604	1.000	1.604
5	0.532	1.007	1.538
6	0.469	0.973	1.442
7	0.413	0.921	1.334
8	0.364	0.855	1.219
9	0.321	0.786	1.107
10	0.283	0.715	1.998

[1] *Jour. Am. Chem. Soc.*, XLI., 53, January, 1919.

The figures given under Th D are based upon the amount of radiothorium which accumulates in mesothorium, and it is this product which also measures the alpha-ray activity of mesothorium. It is evident from the figures given under Th D that the alpha-ray activity of pure mesothorium reaches a maximum between the fourth and fifth year after its preparation and, further, that it is less than 50 per cent. "aged" one year after preparation. In spite of the fact that commercial mesothorium owes a proportion—probably 20 per cent.—of its activity to the presence of radium, it follows that it would be uneconomical to use mesothorium in luminous compound until it had aged for a year or two. It seems evident that the small supply available, the varying activity and the necessity for prolonged aging of mesothorium are some of the reasons that make this material less desirable than radium, both for medical purposes and in luminous compound, especially with an assured supply of radium wholly adequate for both requirements.

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STATISTICAL STUDY OF THE INFLUENZA EPIDEMIC

The American Public Health Association, Vital Statistics Section, appointed a Committee on Statistical Study of the Influenza Epidemic on November 20, 1918. Under the auspices of this committee, a meeting of the state and municipal registrars in the eastern states was held at the University of Pennsylvania, Hygiene Laboratory, Philadelphia, Pa., on November 29 and 30, 1918. There were present, also, at this initial conference, several private statisticians interested in the public health statistics of the epidemic and the results to be derived from study of such data. A series of suggestions was made up, mimeographed and sent to statistical and public health workers for criticism. At the meeting of the Vital Statistics Section in Chicago on December 11, the committee submitted a report on its activities and asked for authority to continue further inquiry into a program of statistical study of the epidemic. The section authorized the continuance of the committee and provided that representatives of the United States Bureau of the Census, of the United States Army and Navy, of the United States Public Health Service, of the state and municipal health boards, and the various statistical, sociological, actuarial and economic associations be represented thereon. The committee was specifically authorized to act in an advisory capacity first, to outline the various sources of data, the minimum standards of tabular and registration practises to be observed by the several organizations providing data, and second, to bring in recommendations on the pathometric or mathematical analysis of published epidemic data. The committee was divided into four subcommittees as follows:

Subcommittee A: *Registration and Tabulation Practise of the Federal Departments.* (Wm. H. Davis, M.D., chief statistician, Division of Vital Statistics, Bureau of the Census, *Chairman;* Richard C. Lappin, *Recorder.*)

Subcommittee B: *Registration and Tabulation Practise of the State Departments and Commissions.* (Otto R. Eichel, M.D., director, Division of Vital Statistics, New York State Department of Health, Albany, *Chairman;* Edwin W. Kopf, *Recorder.*)

Subcommittee C: *Registration and Tabulation Practise of Municipal Boards of Health and of Private Public Health Agencies.* Chas. Scott Miller, M.D., Philadelphia Department of Health, Philadelphia, Pa., *Chairman.*)

Subcommittee D: *Pathometry* (mathematical analysis and interpretation) *of the Epidemic.* (Charles C. Grove, Ph.D., Columbia University, *Chairman;* Arne Fisher, F.S.S., *Recorder.*)

Mr. E. W. Kopf was delegated to act as chairman of the General Committee and to coordinate the work of the several subcommittees. The General Committee of the Vital Statistics Section was authorized to cooperate in statistical matters with the Influenza Reference Committee of the entire association.[1]

[1] See "Influenza Bulletin." *American Public Health Association,* Boston, December 13, 1918.

Federal Statistics of the Epidemic.—At the Washington meeting of Subcommittee A, the following subjects were taken up:

Estimates of population.

Obtaining estimates of Army and Navy populations by five-year age periods, through random sampling if necessary, but by direct tabulation of army and navy enlistment records if possible.

Causes of death reported during the epidemic were to be classified in accordance with the Manual of the International List of Causes of Death and the Index of Joint Causes as published by the Bureau of the Census.

Infant mortality was to be studied in such manner as to show what part of this mortality was probably due to birth mortality arising out of influenzal illness of the mother and to the factor of neglect.

Norms of mortality during September, October and November were also considered.

It was also indicated that it was unwise to draw any conclusions from statistics of variations in bacterial flora at various stages in the epidemic or in different localities unless it was shown that all laboratory conditions had been properly controlled. The Army was requested to supply statistics as to influenzal sickness classified by five-year age periods, by date of onset, by duration of illness in days, by principal complications, showing fatality or lethal rates per one hundred completed cases.

State Statistics of the Epidemic.—Subcommittee B considered the more intimate statistics of the epidemic in the states. The subcommittee pointed out that in certain cities and for certain states valuable data were available in the back files which would lead to the determination of the norm of mortality during the fall and winter months of the year. The social statistics of the epidemic were emphasized. It was urged that statistics of the effect of the epidemic upon the family should be collected. State and municipal governments were urged to make preparations necessary for the proper statistical study of the epidemic data.

Municipal Statistics of the Epidemic.—The subcommittee on municipal statistics discussed chiefly the available data in the files of maternity clinics and visiting nursing associations. It was indicated that thorough study of these records would bring out some of the important facts on the obstetrical data of the epidemic.

Mathematical or Pathometric Study of the Epidemic.—The Subcommittee on Pathometry has outlined for itself the problems of mathematically testing and graduating the crude compiled data for norms of infant and adult mortality. The subcommittee has in mind the frequency curves of mortality from the several important causes of death during the fall and winter months of the year, especially the curves for infant mortality considered as (*a*) "birth mortality" and (*b*) "true infantile mortality." By means of modern analytic methods it was aimed to determine the true "excess mortality" during the epidemic. It was planned also to fit various curves to the observed epidemic data, to compute the equations and the constants of the distributions in the several areas under observation (mean, mode, dispersion, skewness, "excess").

The Subcommittee on Pathometry also anticipated that it could determine by delicate mathematical tests the *probable* date of the beginning, "peak" and ending of the several waves or phases of the epidemic in the various communities, and possibly, the approximate differential equations representing the several recurrences or recrudescences of the epidemic could be established.

International Statistics of the Epidemic.—On January 18, 1918 the Executive Board of the Association directed the chairman of the committee on Influenza Epidemic Statistics to initiate correspondence with sanitary institutes and public health associations abroad, with a view toward drafting a program of international study of the epidemic data. The cooperation of the International Statistical Institute will be solicited.

Methods of Influenza Study Applied in Preventive Medicine Generally.—The methods of higher analysis applied to the influenza epidemic data can be of service to preventive medicine in the study of other diseases. The

profession of statistics is confronted with an opportunity for unparalleled service to the medical sciences, among them preventive medicine.

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SCIENTIFIC EVENTS

GEORGE FRANCIS ATKINSON

The faculty of Cornell University has passed the following resolutions on the death of Professor Atkinson:

The University Faculty desires to express its profound sorrow and its sense of great loss through the death, on November 14, of George Francis Atkinson.

Since his return to his alma mater in 1892, he has been a member of this faculty. In 1896 he was appointed professor of botany. During this period of more than a quarter of a century, which was devoted unceasingly and enthusiastically to research, he became an active working member of numerous scientific societies, and attained an eminent position among the botanists of the world. In mycology, particularly, he had an international reputation and he was regarded as the foremost authority on the fleshy fungi of this country. In June, 1917, the board of trustees generously relieved him of all further teaching and administrative duties in order that he might devote his time entirely to his researches in this field. His exceptional ability and high place among American men of science was formally recognized by his election to the National Academy of Sciences, in April, 1918. To his services as a teacher in that higher sense of the word which implies ability to impart enthusiasm and love for research, the success of the large number of botanists throughout the country who have been his pupils bears glowing testimony.

His end came suddenly as the result of influenza followed by pneumonia, incurred during a collecting trip on the Pacific coast in pursuance of the great monographic study of fleshy fungi upon which he had been engaged for many years, and which was nearing completion. In the death of Professor Atkinson not this faculty alone but the whole community of working men of science have lost a gifted colleague; a man of genius who contributed much to the world's knowledge of botany. His work lives after him, not only in his writings but in the inspiration imparted to a younger generation of investigators in the field in which he was an honored master.

MEDICAL RESEARCH IN AUSTRALIA

The *Journal of the American Medical Association* states that the Walter and Eliza Hall Institute of Research in Pathology and Medicine has been established in Melbourne in connection with the Melbourne Hospital, through the generosity of the trustees of the Walter and Eliza Hall Fund. The institute is controlled by a board representing the trustees, the University of Melbourne and the Melbourne Hospital. A spacious building, including a basement and three stories, has been erected at a cost of over $60,000 in immediate connection with the pathologic department of the hospital. The hospital itself has recently been entirely rebuilt and now contains 350 beds. Applications for the offices of director and of first assistant of the institute are being invited through the agent-general for Victoria, Melbourne Place, Strand, London, from whom full information may be obtained. The director has the management of the institution; devotes his whole time to this work, is responsible for keeping research as the primary object of the institution, will give all assistance to the medical staff and other officers of the Melbourne Hospital in postmortem work and clinical pathology, will make arrangements for clinical instruction and laboratory instruction to medical students in postgraduate work, and provide or maintain the comforts of patients or others residing in, or who use the hospital. His term of service is five years and he is eligible for reappointment. His salary is $5,000 a year, and in addition, the board will procure an endowment insurance on the director's life, to be payable at the age of sixty or predecease, the annual premium for this insurance being $375. If the director comes from America, $625 will be allowed for travel expenses. Ap-

plicants should be between the ages of twenty-five and thirty-five. All applications must be accompanied by original or certified copies of testimonials, schedule of experience, list of research work and photograph. It is expected that the director will take duty, October 1, 1919. The first assistant director shall be not over thirty-five years of age, and will be expected to devote his entire time to the work of the institute as directed by the board and under the instruction of the director. He will have the management of the institution in the absence of the director, will give such assistance as may be prescribed to the medical staff or other officers of the Melbourne Hospital in postmortem work and clinical pathology and bacteriology, and will take such part as may be prescribed in the instruction of medical students in laboratory work and in postgraduate instruction. He holds office for five years and is eligible for reappointment. His salary will be $3,000 a year.

THE BRITISH GUIANA RESEARCH STATION OF THE NEW YORK ZOOLOGICAL SOCIETY

IN his introduction to the volume "Tropical Wild Life in British Guiana" Colonel Theodore Roosevelt said: "The establishment of a Tropical Research Station in British Guiana by the New York Zoological Society marks the beginning of a wholly new type of biological work, capable of literally illimitable expansion. It provides for intensive study, in the open field of the teeming animal life of the tropics."

Almost every member of the staff of this station has been serving in the American army, and now at the conclusion of the war, an expedition is about to start for British Guiana to resume scientific investigation. The financial support necessary for this undertaking has been provided by the New York Zoological Society through the generosity of five members of the board of managers, Col. Anthony R. Kuser, C. Ledyard Blair, Andrew Carnegie, George J. Gould, and A. Barton Hepburn, and the requisite leave of absence has been granted to the staff in the service of the society.

On February 26 three of the staff sailed for the south, William Beebe, director, Alfred Emerson, research assistant, and John Tee-Van, artist and preparateur. Their outfit will include the most complete laboratory equipment ever taken to the tropics, and the station will be reopened under most auspicious circumstances at Katabo, its permanent headquarters. This is a most beautiful site, shaded with hundred foot bamboos, at the very edge of the jungle, and directly at the junction of two great rivers, the Mazaruni and the Cuyuni. Here several bungalows and a large laboratory await occupancy, and here it is hoped that many of our American scientific men may find a stimulating field for the prosecution of their particular lines of research.

While each member of the regular staff will undertake some special investigation, yet it is the intention of the director that all will unite in some definite ecological study of the interrelations of certain groups of organisms, in the hope of gaining some insight into more general problems of evolution, of adaptation, of survival. The results of all the studies will be published by the New York Zoological Society in the second volume of "Tropical Wild Life."

Three years ago Colonel Theodore Roosevelt visited the Station and wrote of its functions and activities. This year Professor Henry Fairfield Osborn, president of the Zoological Society and of the American Museum, accompanies the expedition and will spend several weeks in observing the unique conditions under which the undertaking carried on, and will advise as to its extension and future.

Professor William Morton Wheeler, of the Bussey Institution, Harvard University, and Professor Ulric Dahlgren, of Princeton University, and Professor Alfred Reese, of the University of West Virginia, will join the station this year, for observations on ants, electric fishes and crocodiles, respectively. Director N. L. Britton, of the New York Botanical Garden, is planning a complete survey of the forests.

SCIENTIFIC NOTES AND NEWS

Dr. Livingston Farrand has resigned the presidency of the University of Colorado to become the executive head of the American Red Cross. Dr. Farrand was formerly professor of anthropology at Columbia University.

Professor Albert Sauveur, of the metallurgical department of Harvard University, has returned to Cambridge from France, where he has been engaged in war work during the past year. While stationed in Paris, Professor Sauveur was in charge of the section of metallurgy in the technical division of the United States Air Service.

Dr. Thomas McCutcheon, associate professor of chemistry, at the University of Pennsylvania, has resumed his work there. Dr. McCutcheon has been in the service of the War Industries Board and has been in England and France.

Major George B. Wallace, professor of pharmacology, and Captain C. J. Tyson, instructor in medicine at the University and Bellevue Hospital Medical College of New York University, last week resumed their duties after army service in France. Major Wallace saw long service with Base Hospital No. 1 at Vichy, near Paris. Captain Tyson, at first connected with Base Hospital No. 1, was later made assistant sanitary inspector with the Second U. S. Field Army, with which he saw active service at the front.

Captain P. L. Thorne, assistant professor in mathematics at New York University, resumed his duties with the faculty this week. After entering the service, Captain Thorne served for a time as an artillery instruction officer but later went to the front in France with the Sixtieth Heavy Artillery regiment.

Captain I. F. Eldredge has returned from France and will resume his duties as forest supervisor of the Florida National Forest. Captain Eldredge was associated with the 10th Engineers (Forestry).

Dr. F. L. Wells, having been released from military duty with the Air Service, has returned to his former work at McLean Hospital.

Dr. J. P. Rowe, professor of geology at the State University of Montana, who is on leave of absence for war community service, is now in Los Angeles. His stay is indefinite because the work he is doing will be continued as long as men are at cantonments and naval training stations.

Captain W. D. A. Peaslee, assistant professor of electrical engineering at the Oregon Agricultural College on leave of absence, has been appointed a member of the consulting staff of the American peace conference.

Sergeant H. M. Wight, instructor in zoology at the Oregon Agricultural College on leave of absence, has been awarded the French war cross for heroism on the field of battle.

Sir Richard Threlfall, formerly professor of physics in the University of Sydney, has been elected a member of the Athenæum Club, London, for eminence in science.

Secretary Lane has appointed a commission of five mining and metallurgical experts from the Bureau of Mines and the Geological Survey to visit Europe to observe and assist reconstruction methods in the devastated regions of France and Belgium. The chairman of the commission, Dr. Frederick G. Cottrell, chief metallurgist of the Bureau of Mines, and George S. Rice, chief mining engineer of the bureau, have sailed for France. Frank H. Probert, consulting engineer of the bureau and professor of mining in the University of California, sailed several weeks ago, and R. H. Cameron, consulting chemist of the bureau, and Hoyt S. Gale, of the Geological Survey, are expected to leave early in March.

C. L. Alsberg, chief of the Bureau of Chemistry, U. S. Department of Agriculture; John Howland, professor of pediatrics, Johns Hopkins University Department of Medicine, and Henry Kraemer, professor of pharmacognosy, University of Michigan, college of pharmacy, have been reappointed to serve on the Council on Pharmacy and Chemistry for a further period of five years. W. W. Palmer, associate professor of medicine at the college of physicians and surgeons of Columbia University, has been selected to fill the vacancy caused by

the death of Professor J. H. Long, Northwestern University, who had been a member of the council since its organization.

C. W. HUNGERFORD, assistant plant pathologist at the Oregon Agricultural College, connected with the office of cereal investigations, Washington, D. C., has left for Moscow, Ida., where he has been appointed plant pathologist in the University of Idaho experiment station.

MISS KATHERINE VAN WINKLE, a former student in the University of Washington, Seattle, Wash., is spending the year at Cornell University, where she holds a fellowship in the geological department. She is specially interested in making a comparison of the East and West Coast Eocene Mollusca.

C. M. BAUER, formerly with the U. S. Geological Survey, and Mr. R. W. Clark, formerly of the geological department of the University of Michigan, have opened a consulting office at Okmulgee, Oklahoma.

EDWARD W. BERRY, professor of paleontology, and Joseph T. Singewald, Jr., professor of economic geology, at the Johns Hopkins University, will leave in April to spend six or seven months in geological explorations in the Andes of Peru, Bolivia and Chile, under the George Huntington Williams Memorial fund.

HENRY S. GRAVES, United States forester, spoke on "The Need of Private Forestry," before the Boston Chamber of Commerce on February 24, 1919. This address was part of the program in connection with the forestry conference held at Boston on February 24 and 25 under the auspices of the Massachusetts Forestry Association.

THE Washington Section of the Society of American Foresters, at its meeting on February 26, 1919, had presented to it papers on the "Application of the Principles of Plant Succession in relation to Range Revegetation," by Arthur W. Sampson, and in relation to Forest Regeneration, G. A. Pearson.

THE fifth Harvey Society lecture of the series will be by Colonel F. P. Underhill on "War Gases" at the New York Academy of Medicine on Saturday evening, March 15.

THE annual Darwin Day lecture at New York University, commemorating his birthday, was given on February 12 in the auditorium at University Heights by R. L. Ditmars, curator of reptiles, at the New York Zoological Gardens. His subject was "Life at the Bottom of the Sea," illustrated by four reels of motion pictures of submarine life taken in the bay of Naples. Professor Charles L. Bristol also spoke on the work of Darwin.

A JOINT meeting under the auspices of the New York Section of the American Electrochemical Society with the New York Section of the American Chemical Society and the Society of Chemical Industry was held at Rumford Hall on February 7, when the program was "Electro-chemistry in War Time" by Lieut. Col. Wilder D. Bancroft, C.W.S. U. S., and "War Time Trip to Europe" by H. C. Parmalee.

THE American Institute of Mining Engineers meeting in New York on February 17 held a service in memory of Dr. Rossiter W. Raymond, second president of the institute and secretary emeritus at the time of his recent death.

DR. TIMOTHY MATLACK CHEESMAN, instructor in bacteriology in Columbia University from 1888 to 1899 and later a trustee of the university, died on February 28, at his home at Garrison-on-Hudson, aged sixty-six years.

THE death on February 8 in Philadelphia, from pleurisy and pneumonia, of Dr. Frederic Putnam Gulliver, of Norwich, Conn., is announced. Dr. Gulliver was connected with the chestnut blight commission in Philadelphia for some years, prior to which he was topographer in the United States Geological Survey. For eight years he was master of science at Saint Mark's School in Southborough, Mass. He was secretary of Section E (Geology and Geography) of the American Association for the Advancement of Science from 1907 to 1911.

DR. PAUL CARUS, editor of the *Open Court* and *The Monist,* the author of many philo-

sophical books and articles, died on February 11. He was born in Germany in 1852.

Mr. Alonzo Howard Clark, curator of the division of history of the National Museum, and editor of publications at the Smithsonian Institution, died on December 31, 1918, in his sixty-ninth year.

The death has occurred of Miss Laura Bradstreet White, a teacher in the Girls' High School in Boston from 1872 to 1916, and head of the science department since 1875. She is described by one of her colleagues as a woman of "rare social gifts, a leader among men and women, an authority on chemistry, and a force among teachers as well as those taught."

G. Carey Foster, F.R.S., formerly principal of University College, London, and previously professor of physics there from 1865 to 1898, died on February 9 at the age of eighty-three years.

R. A. E. Blanchard, professor of parasitology in the faculty of medicine, University of Paris, has died aged sixty-two years.

Dr. I. C. L. Holm, leader in the development of the sanatorium system in Norway, has died at the age of seventy three years.

Dr. W. J. Holland, the director of the Carnegie Museum, desires to notify the direction of all museums and all collectors of birds that a shipment of birds made for the Carnegie Museum in French Guiana and in the vicinity of Pará, Brazil, was broken into and robbed of a large part of its contents on its arrival in New York City early in February, and he desires to warn all parties to whom specimens may be offered, coming from these parts and identified as collected by S. M. Klages, that such specimens are stolen goods, and he also requests any one to whom such material may be offered to hold it and to notify him of the name and address of the person offering them, so that the proper steps may be taken for their recovery.

The annual meeting of the American Association of Anatomists which was postponed last December, will be held April 17 to 19 in Pittsburgh. Professor R. R. Bensley, of the University of Chicago, is president of the association and Professor C. R. Stockard, of Cornell University Medical College, is secretary.

The American Association of Petroleum Geologists will hold its fourth annual meeting at Dallas, Texas, on March 13 to 15 next. The headquarters of the Association will be at the Adolphus Hotel. An interesting and attractive program has been arranged. Further details in regard to the meeting can be secured by addressing Mr. W. E. Wrather, 6044 Bryan Parkway, Dallas, Texas.

The Bureau of Economic Geology and Technology of the University of Texas is endeavoring to make a geological map of every county in the state. In the interest of this work E. H. Sellards, geologist in the Division of Economic Geology of the Bureau, recently spent two months in San Antonio making a map of Bexar county.

Dr. R. F. Shields, of the University of Shantung, has recently accomplished the difficult task of translating Lewis and Ströhr's "Histology" into Chinese. An abbreviated edition of Halliburton's "Physiology and Histology" had been previously available to Chinese medical students, but Dr. Shield's book is apparently the first in that language devoted entirely to microscopic anatomy.

The *Publishers' Circular and Booksellers' Record,* as quoted in *Nature,* records a total of 7,716 books as having been published during the year 1918. This is a decrease of 415 compared with the previous year, and it is accounted for chiefly by a falling off in the number of works of fiction (—523) and juvenile literature (—155); other classes that have also decreased slightly are education, agriculture, domestic, business, history and geography. On the other hand, sociology has increased by 112, technology by 110, medicine by 80, and poetry by 98. Under "Science" the number of new books recorded is 232, also 5 translations and 28 pamphlets. In addition, there were 64 new editions, making a total of 329. In the year 1914 science occupied the third place in twelve classes of literature, and technology the fifth place; in 1918 technology

was in the eighth place and science in the tenth.

VOLUME VI. of "Fossil Vertebrates in The American Museum of Natural History" has just appeared from the department of vertebrate paleontology of that institution. It includes contributions 168 to 192, which appeared during the years 1915 to 1917 inclusive, from the studies of Osborn, Matthew, Brown, Granger, Gregory, Mook, Anthony, Watson and von Huene. These articles are collected from the *Museum Bulletin* volumes of the corresponding years. The edition is limited to sixty and is distributed to the principal research centers in this country and abroad.

The American Journal of Orthopedic Surgery, the official publication of the American Orthopedic Association, will become also the organ of the newly-formed British Orthopedic Association under the name of the *Journal of Orthopedic Surgery.* This has been brought about through the increased interest and importance of the subject of orthopedics on account of the war. It is believed the purposes of the orthopedic branch of surgery will be best served by the amalgamation, an idea long cherished by Lieutenant-Colonel Robert B. Osgood, M.C., U. S. Army, Boston, who promoted the establishment of the American journal. The journal will be published from the present offices in Boston. The committees appointed by the British Orthopedic Association consist of R. C. Elmslie, editor, London; T. R. Armour; W. H. Trethowan and H. Platt; while Charles F. Painter, Boston, and Robert W. Lovett, Boston, comprise the committee appointed by the American Orthopedic Association. Miss Hannah Lissner, Boston, has been appointed in charge of the editorial department of the journal in America.

IT is stated in *Nature* that a party of American technical journalists recently on a visit to England as guests of the government was entertained by the Company of Stationers on December 18, together with a gathering of British colleagues. The meeting had been arranged by the Institute of Journalists' Circle of Scientific, Technical and Trade Journalists, after the return of the American party from its tour of France. After tea and a reception a meeting was held, at which Mr. H. C. Parmelee, Mr. S. O. Dunn, Mr. H. Cole Estep, Mr. H. M. Swetland and Mr. A. J. Baldwin delivered short addresses on behalf of the American technical journalists, while Mr. L. Pendred, Professor R. A. Gregory and Mr. A. C. Meyjes responded for the British technical press. Some striking instances of the services rendered in connection with the war and their influence on the industrial development were given, and stress was laid on the value of wide and thorough training, with the view of raising the status of technical journalism as a profession. A resolution was moved by Mr. H. C. Parmelee, seconded by Mr. A. C. Meyjes, and carried unanimously, urging the desirability of closer cooperation and periodical exchange of views between the trade and technical press in the two countries. Mr. L. Gaster, chairman of the circle who presided, voiced the pleasure of the meeting in welcoming the guests, and Mr. A. J. Baldwin expressed the hope that British technical journalists would reciprocate by sending a deputation to the United States in the near future.

WE learn from *Nature* that the annual meeting of the English Geographical Association was held on January 3 and 4. In the afternoon of the former day Mr. A. R. Hinks gave an address on war-maps at the Royal Geographical Society's house. A collection of captured maps and maps made by the Royal Geographical Society were on view; and there was also an exhibition of war maps, lent by the authorities, at the London Day Training College, where the remaining meetings were held. An address was given by the president, Professor Grenville A. J. Cole, on the narrow seas and on the Arctic route to Muscovy. Other subjects brought forward were: The historical geography of West Africa, by Mr. W. H. Barker, and when and how often should we teach the geography of the British Isles to our pupils, a discussion led by Miss D. D. Adam and Mr. C. B. Fawcett.

The American Journal of Physical Anthropology, founded and edited by Dr. Ales Hrdlička, of the U. S. National Museum, has completed its first volume. The contents apart

from literature received and notes are as follows:

Hrdlička, Aleš: Physical Anthropology: Its Scope and Aims.
Miller, Gerrit S., Jr.: The Piltdown Jaw.
Hooton, Ernest A.: Eskimoid Characters in Icelandic Skulls.
Holmes, William H.: Committee on Anthropology, National Research Council.
Keith, A.: Anthropological Activities in connection with the War in England.
Hrdlička, Aleš: Physical Anthropology: Its History in America.
Williams, E. T.: The Origin of the Chinese.
Guthe, C. E.: Russian Jews in Boston.
Hurlin, Ralph G.: Preparation of Skeletons by Bacterial Digestion.
Hrdlička, Aleš: Physical Anthropology: Recent History and Present Status.
Babcock, Wm. H.: Early Observations in American Physical Anthropology.
Giuffrida-Ruggeri, V.: The Origins of the Italian People.
Schultz, Adolf H.: External Nose, Bony Nose and Nasal Cartilages, in Whites and Negroes.
Lundberg, Emma O.: The Illegitimate Child and War Conditions.
Hrdlička, Aleš: Physical Anthropology: Conclusion.
Boas, Franz: Anthropology of Sweden.
Farabee, Wm. Curtis: The Arawaks of Northern Brazil and Southern British Guiana.

UNIVERSITY AND EDUCATIONAL NEWS

The Carnegie Corporation of New York has voted a grant of $500,000 to the Medical Department of Queen's University, Kingston, Ont. This grant is related to that in the will of Dr. James Douglas, New York, and is conditional or raising an additional $500,000.

The *Journal* of the American Medical Association states that plans have been drawn for a proposed new building on the grounds of the Johns Hopkins Hospital to house the medical library of the hospital and the surgical histories of patients who have been treated there, and will also contain an auditorium, with subsidiary rooms for religious and philanthropic work. The library will be built in honor of Dr. Henry M. Hurd, Baltimore, who for many years was superintendent of the hospital. The structure, according to the present plans, will cost $100,000. Gifts of $50,000 and of $30,000 have been made.

Under the will of the late Mrs. Purdie the residue of her estate, amounting to about £25,000, has been bequeathed to the University of St. Andrews for the promotion of research in chemistry. Her husband, the late Professor Purdie, had built for the university an institute for chemical research.

Dr. H. M. Parshley, of the department of zoology in Smith College, has been promoted to an associate professorship. He has been appointed associate in field zoology at the Cold Spring Harbor summer laboratory.

Dr. Harry N. Eaton, formerly associate professor of geology in the Pennsylvania State College, has been appointed to a similar position in Syracuse University. He spent the past fall and early winter in research in the paleontological laboratory of Dr. G. D. Harris at Cornell University.

Dr. W. E. Milne, recently of Bowdoin College, has accepted the position of professor of mathematics at the University of Oregon.

DISCUSSION AND CORRESPONDENCE

THE KATMAI NATIONAL MONUMENT AND THE VALLEY OF TEN THOUSAND SMOKES

To the Editor of Science: In your issue of January 3 you print a note headed "The Katmai National Monument," derived from the annual report of the director of the National Park Service. In such a report, compiled by men not familiar with the Valley of Ten Thousand Smokes and not students of volcanism, some misconceptions and misinterpretations are very apt to creep in. This was particularly likely in the present instance, since the publication of the technical papers devoted to the scientific results of the expeditions, from which alone the necssary information could have been derived, has been delayed.

The hypothesis that would occur to any one as the most probable explanation of the Valley of Ten Thousand Smokes is that given

in your article. But no scientist would venture categorically to affirm, without investigation, the correctness of such a hypothesis, as is done in your columns when you state that the valley is due to heated rocks which

> turn to instant steam the spring and drainage waters of many a surrounding mile of foothills. Thus originates the steam which bursts forth from the myriad valley vents. The phenomenon is familiar in the neighborhood of most volcanoes which still are classed as active. Steaming springs, a later stage of the vents in this valley, are found upon the flanks of several of the most prominent of our Cascade volcanoes, and are numerous around the base of Lassen Peak.

Now, as a matter of fact, there is no evidence that the vents of the Ten Thousand Smokes have any connection with the vaporization of surface drainage. The writer gives strong reasons for the belief that they are, on the contrary, true volcanoes in an article entitled "Are the Ten Thousand Smokes Real Volcanoes?"[1] There is not space to give the evidence here, but some of the facts which lead to that conclusion may be summarized.

1. The disposition and magnitude of the vents are such as to make them very difficult to explain on the surface water hypothesis.[2]

2. The temperature of all the larger vents in the valley is far above that of ordinary steam. The expedition of 1918 measured many temperatures above 300° C., while the highest was 432° C. Curiously enough the "smoke" from a number of these vents is hotter at the surface of the ground where it meets the cold atmosphere than it is a few feet down the throat. In one case where the temperature is 352° C. at the surface it is only 245° C. three feet down in the throat—a difference of 107° C.[3]

3. The smoke from the vents is by no means all water vapor. It includes many other volcanic gases. Most notable among which is perhaps hydrofluoric acid in such high concentration as to etch the glass on the inside of the vacum tubes which were used for collections. Dr. E. T. Allen, of the Geophysical Laboratory, who has made a preliminary examination of the deposits, has informed me also that the incrustations around the vents are rich in fluorides. The chemical study of the gases, undertaken by Dr. E. S. Shepherd, of the same institution, would probably have been completed by this time if it had not been interrupted by the diversion of chemists to war problems.

4. The Vents of the Ten Thousand Smokes are by no means secondary openings consequent upon the eruption. On the contrary, they are associated with an extraordinary deposit of fragmental material poured out *before* the explosion of Katmai. This deposit is described in detail in the third of the papers giving the scientific results of the expeditions.

There are still very many problems to be worked out in connection with this remarkable district but even now it may be asserted with confidence that the Valley of Ten Thousand Smokes is no secondary phreatic phenomenon but on the contrary is a true manifestation of the forces of volcanism of a character and magnitude unparalleled in the present day world.

ROBERT F. GRIGGS
DIRECTOR KATMAI EXPEDITION,
NATIONAL GEOGRAPHICAL SOCIETY

[1] "Scientific Results of the Katmai Expeditions of the National Geographic Society, II," *Ohio Journal of Science*, December, 1918.

[2] For details see paper cited.

[3] The studies of temperature upon which these statements are based will be given in full in the fifth number of the "Scientific Results of the Expeditions," which is in press.

HEREDITARY DEFICIENCIES IN THE SENSE OF SMELL

IN a recent number of SCIENCE, Professor Glaser[1] has recorded a family history which is supposed to show inheritance of deficiencies in the sense of smell. There are certain modifying conditions, not considered in estimating the history, which should be kept in mind in analyzing this case in particular, as

[1] SCIENCE, N. S., Vol. XLVIII., p. 647, December 27, 1918.

well as the inheritance of various degrees of anosmia in general.

"The case in point is that of a young Russian Jew, a fugitive from Kiev." This individual from Glaser's description presents a definite case of anosmia. He is devoid of powers of olfaction, though possessing a sense of feeling in certain regions of the nasal epithelium due to the presence of normal trigeminal endings.

The family of which he is a member has certain degenerate characteristics, which probably result from diseased conditions, since he is from a region in which syphilis and other diseases are extremely prevalent. There is much stammering; early loss of incisors (indicating epithelial infections); unusually wide thumbs; "considerable mental powers," though doubtless morbid as shown by "excessive sex interest," etc. In this family there are "several individuals abnormal in their sensitivity to odors."

It so happens that two sisters are reported to have a normal sense of smell, though it is not indicated whether this diagnosis is based on their own statements or on some form of examination. At least such conclusions only approach desired accuracy when based on simple measurements with an ordinary olfactometer. One brother has complete anosmia and another is said to exhibit the condition to a certain degree. The mother of these sibs and her father were reported as cases of complete anosmia. Such reports, Glaser believes, show 'offhand, certain resemblances to sex-linked inheritance." There was also "smell-blindness" (an unfortunate expression used by Blakeslee[2] and going dangerously well with sex-linked inheritance) in certain members of a collateral line.

After inquiries the young man examined by Dr. Glaser finds that the defect is "inbred" in the locality from which he comes "so that quite a number are afflicted with it."

I am certain that Dr. Glaser will pardon me for taking the liberty of questioning the value of this record from a genetic standpoint, and of pointing out certain serious objections to it.

In Poland, parts of Russia around Kiev, Galicia and Hungary it is well known that the serious disease rhinoscleroma, first described by Hebra in 1870, is endemic. Such a disease readily destroys the olfactory epithelium beyond repair. Rhinoscleroma does not occur in the United States except among immigrants from the above regions; several cases have been described by Emil Mayer[3] in New York City. In addition to this marked disease, various forms of chronic rhinitis causing congestion and fibrous thickening of the nasal epithelium are extremely common among Russian Jews, as well as other races of Russian and Poland. Nasal polypi actually modifying the form of the external nose and also causing anosmia are common. Several of these diseases and catarrhal conditions occur somewhat more frequently among men than women owing to greater exposure to colds and general nasal infections.

My attention has frequently been attracted to these facts during a number of years' experience in the anatomical dissecting room. One often notices among Russian Jews a lack of the sense of smell to such a degree as to be unable to detect the ordinary strong odors of embalming fluids, etc. Many such persons have chronic rhinitis or other affections of the turbinal regions which tend to destroy or cover over the olfactory epithelium of the upper nose, causing a loss of the sense of smell even when very young.

It would seem rather probable that the family described by Glaser presents anosmia among its members as a result of diseased conditions. Evidence derived from the prevalence of even rhinoscleroma along with many ordinary nasal affections, in the region from which the examined man came, also points more directly to disease as an explana-

[2] "Unlike Reactions of Different Individuals to Fragrance in Verbena Flowers," Science, N. S., Vol. XLVIII., p. 298, September 20, 1918.

[3] "Scleroma of the Larynx," *Am. Jour. Med. Sci.*, N. S., CXXXIII., p. 751, 1907. "Rhinoscleroma in North America," *Laryngoscope*, December, 1908.

tion of the number of persons exhibiting anosmia in this community, than to some form of inheritance.

I wish in no way to be understood as opposing the belief that deficiencies in the sense of smell may be inherited in human beings. On the contrary, it seems certain that defects in the sense of smell must be inherited, since this sense in man is so degenerate as to be vestigial in function, often strangely one-sided in its manifestations, or even completely wanting. The extent to which the sense is developed varies greatly among individuals. Many persons with apparently normal olfaction are actually unable to appreciate certain particularly pungent odors such as those of violets, or hydrocyanic acid, etc.

In deciding the cause of deficient olfaction it is most important to recognize the favorable location for exposure to disease of the olfactory epithelium. Any attempt to determine the manner of inheritance of the different degrees of anosmia, therefore, must necessitate a careful examination of the nasal epithelium in all so-called abnormal individuals in order to detect the vitiating effects of disease.

In heredity studies of no other sense would such considerations be more important than in investigations based on the degree of efficiency of the sense of smell. Diseases of the nasal epithelium are often but slightly contagious thus affecting only certain members of a family, and on account of greater exposure, more probably the male members, as in the family now considered. Some diseases of the nasal passages as rhinoscleroma are endemic in certain regions and might cause secondary conditions which would seem to be "inbred" in the community.

Anosmia is known among women as well as among men, though probably more often in the latter. Until, however, there is statistical evidence indicating a decided preponderance of the defect in one sex, when not the direct result of disease, there is no reason in the absence of further genetic data for assuming the condition to be sex-linked in inheritance. Anosmia is in no way comparable to color-blindness as the expression "smell-blindness" might suggest. It is comparable only to defective sight or actual blindness when this is due to either retinal, nerve, fiber-tract, or cerebral center deficiency.

CHARLES R. STOCKARD
CORNELL MEDICAL COLLEGE,
NEW YORK CITY

QUOTATIONS

THE ORGANIZATION OF RESEARCH IN GREAT BRITAIN[1]

THE Committee of the Privy Council for Scientific and Industrial Research has published its third annual report (for the year August 1, 1917, to July 31, 1918).[2] Practically it is a new government department which administers the Imperial Trust for the Encouragement of Scientific and Industrial Research. During the last financial year the committee expended £30,825, and it is convinced that the value to the nation of the work done is beyond all comparison greater than the cost, and will, as time goes on, bring continually augmented returns, for the garnering of the harvest of research is sure though slow. The estimated expenditure for the current financial year is £163,350, which includes a sum of £89,750 for the National Physical Laboratory. In addition, the laboratory is rendering services to the several war departments, which will be met out of the vote of credit, at an estimated cost of £74,100. The grants in aid of industrial research associations will be met out of the fund of one million held by the Imperial Trust.

The report by the Advisory Council, of which Sir William McCormick is chairman, and Sir Frank Heath, K.C.B., secretary, gives an account of the progress made in the establishment of these associations and the steps that have been taken in the organization of national research. Some thirty industries are

[1] *British Medical Journal.*

[2] "Report of the Committee of the Privy Council for Scientific and Industrial Research for the Year 1917–18." H.M. Stationery Office. Price 4d. net. (Cd. 9194.)

actively engaged in establishing such associations, and licences have already been issued by the board of trade to three. Among them is the British Scientific Instrument Research Association, founded through the efforts of the optical industry; the department has guaranteed a total expenditure by this association, in accordance with an approved scheme, of not more than £40,000 during the first five years. In accordance with the terms of the agreement with the Royal Society, the department became responsible for the maintenance of the National Physical Laboratory on April 1, and has given special attention to the salaries of the scientific and technical staff. Hitherto the laboratory to balance its expenses, has been obliged to rely in the main upon fees paid to it for testing; as a result its officers have been seriously underpaid, and the best of its senior men are continuously being attracted away from it. It is now recommended that the scales of salaries should be completely overhauled, and that adequate provision should be made for superannuation.

One of the subdepartments through which the Department of Industrial and Scientific Research works is the Food Investigation Board, of which Mr. W. B. Hardy, secretary of the Royal Society, is director. This board has several subcommittees—on fish, on meat, on fruit and vegetables, on oils and fats, and on engineering. It has been giving particular attention to the preservation of food, especially by cold storage. It is acting in close consultation with the Food (War) Committee of the Royal Society, and the work has grown rapidly. On this head the report contains the following significant observation: "Events have justified the rapid decisions which we took in the summer of last year, while experience has shown that the appointment of a responsible director to organize a group of researches of national importance assisted by an advisory board of distinguished men of science and affairs greatly facilitates prompt action and the proper coordination of all the work in accordance with a definite scheme. Research work, like other forms of creative activity, will not flourish under committee rule."

Last year, at the invitation of the Home Office, the department appointed a committee, of which Dr. J. S. Haldane is a member, to inquire into the types of breathing apparatus used in coal mines. This committee has just presented its first annual report,[3] in which it draws attention to certain serious defects in existing mine rescue apparatus, and in the training of men to use them. The defects, it is stated, are mainly matters of detail, and suggestions are made for their improvement, for the fixing of standards of achievement, and for preparing the ground for further progress in experimental investigations. Experimental work is being carried on for the committee at the Heriot Watt College, Edinburgh, under the direction of one of its members, Dr. Henry Briggs, who has established a physical testing station which will be run by a military staff attached to the Scottish command. For the War Office the committee has examined and reported on several sets of captured enemy breathing apparatus, and has advised that special inquiries should be made into the storage and supply of liquid and compressed oxygen, and other gases. In conjunction with the Admiralty and the War Office a research clearing house committee has been appointed to coordinate the investigations into gas problems conducted by the different departments, and to ensure rapid interchange of knowledge and experience, questions of particular difficulty being referred to the science department.

The department has also established, jointly with the Medical Research Committee, an industrial fatigue research board with Professor Sherrington as chairman. With the board is associated a panel of representative men and women from each of the industries being studied, who will join the board as each trade in turn comes under review. It will investigate "the relations of the hours of labor and of other conditions of employment, including methods of work, to the production of in-

[3] Department of Scientific Industrial Research. First Report of the Mine Rescue Apparatus Research Committee. H.M. Stationery Office. Price 1s. 9d. net.

dustrial fatigue, having regard both to industrial efficiency and to the preservation of health among the workers." Grants are made to aid researches undertaken by independent bodies and also to individual students in research work; in making them the council has been guided by its knowledge of the quality of the research work undertaken by the professor or head of the department who recommends the student.

In referring on a previous occasion to the work of this new department we expressed the hope that though it was primarily established to encourage the application of scientific research to industrial methods, it might become the rallying point of other scientific branches subsidized by the government, eventually developing into an independent Ministry of Science. These hopes have been realized to a considerable extent, and we find no evidence that the department is regarded as a temporary expedient. Indeed, another step forward has been taken which we hardly dared to anticipate. The annual report of the department contains a series of paragraphs relating to the development of the organization of research in the Overseas Dominions. The home department has been in close touch with the Canadian Honorary Advisory Council for Scientific and Industrial Research, which was incorporated by a Canadian Act of Parliament a year ago. This Canadian council has promoted many valuable researches and inquiries, some of which have already produced important results. Again, in Australia, an Advisory Council of Science and Industry has been established, and has started a number of investigations which have aroused the active interest of manufacturers and others likely to benefit by the systematic application of science to industry. The New Zealand government took initial steps to organize scientific and industrial research as long ago as 1916, but the matter does not there seem to have passed beyond the stage of discussion. In South Africa there is an Industries Advisory Board, which deals not only with scientific and industrial research, but also with statistics of production, factory legislation, the encouragement of industries, and the development of natural resources. Finally, it is the intention of the government of India to establish after the war an Industrial Board and Department, which will succeed the Indian Munitions Board and extend its sphere of operations. As the chairman of that board has pointed out, munitions for a modern army cover practically all the wants of the civil community. It is also to be noted that a National Research Council was established in the United States of America in 1916, under the auspices of the National Academy of Sciences, and largely through the initiative of its president, Dr. Welch, and of Professor Hale. This council, as we have shown on previous occasions, did much valuable preparatory work before America entered the war, and since then it has so grown in usefulness and power that President Wilson has issued an executive order putting it upon a permanent basis.

The letter in which the Lord President, Lord Curzon of Kedleston, presents the report of the British Advisory Council to the King in Council, concludes as follows: "The foundations of a national system of scientific research are being truly laid. In the final structure as they (the Advisory Council) are planning it, the universities and technical colleges, the learned societies and the industries will be found taking their due place; not in subordination to the state, as our enemies like to see them, but working together for the common good in helpful cooperation."

SPECIAL ARTICLES

THE RELATION OF THE SECTOR OPENING OF THE SECTOR PHOTOMETER TO THE EXTINCTION COEFFICIENT

IN determining absorptions with a spectrograph and sector photometer it is necessary to know the relation existing between the sector opening and the extinction coefficient. If the two beams whose intensities are to be equalized by interposed sectors be donated by I and I' respectively, then

$$\log \frac{I}{I'} = e$$

defines e as the extinction coefficient of the

substance for which I' is the transmitted beam and I the corresponding incident beam. If these two beams, I and I', be equalized photographically by means of interposed rotating sectors, S and S', then some relation exists between I/I' and S'/S.

A previous determination by H. E. Howe[1] of this relation made

$$\frac{I}{I'} = \frac{S'}{S}$$

where S is the variable sector cutting down the beam I till it balances the beam I'. The equality was established by measuring with a sector photometer the transmissions of neutral smoke-glass plates, the transmissions of which had previously been measured on a visual spectrophotometer.

In further establishing the validity of this equality the method here employed has been to use likewise two beams of known relative intensities determined geometrically as a function of the relative distances of their sources from the slit of the spectrograph.

Using the Hilger quartz spectrograph, size *C*, in front of one half of a slit 3 mm. long there was placed a total reflecting prism whose face was illuminated through a variable sector by a fixed Nernst lamp. The illumination of the other half of the slit was accomplished by another Nernst lamp arranged on a runway in the axis of the collimator so that its distance from the slit could be varied at will.

The lamps were on the same 110-volt alternating current, city circuit, and plates were always made under such conditions that the voltage did not vary more than two volts during the course of an experiment. The lamps being of the same construction it seemed reasonable to suppose that the simultaneous variations in candle power of the two lamps due to such slight variations in voltage would be equivalent.

A series of exposures were made on successive portions of a plate with the movable lamp set at distances increasing by small increments. Such a series of exposures would then be expected to contain one at which the illumination by the movable lamp would balance that by the fixed lamp as judged by equal blackening of the spectrum bands on the plate.

The average distance for such a balance with the sector at rest, as determined by making settings with increments of half a centimeter, was about 40 cm. It was possible to estimate the true distance to tenths of a centimeter. With the sector running corresponding settings of the movable lamp were made for various openings of the sector, the principal openings being 7.3°, 10° and 19°. The following table gives the results for these openings, the figures being all reduced to a common denominator by dividing the distance of the movable lamp from the slit by the initial distance at which the two beams balance with the sector at rest. The figures are arranged in rows according to the sector opening and in columns according to the individual plates and set ups of the apparatus.

Sector	Distance Observations	Average	Theoretical $\frac{I}{I'} = \frac{S'}{S}$
19°	432, 432, 443, 439, 444, 437, 432, 436, 438, 441, 440, 440	438	435.4
10°	617, 596, 591, 596, 591, 610, 591, 600, 600, 614, 614	602	600
7.3°	712, 690, 695	699	702

The apparatus was taken down and realigned several times in order to eliminate any systematic error. Considerable care was taken to have the spectrograph and runway level, and to have the runway so that the Nernst filament remained in line with the collimator axis. This was accomplished in some instances by halving the distance between the two points at which the spectrum disappeared in shoving the lamp from side to side, and in some instances by placing the filament at one end of the runway in contact with the slit, at the other end making a symmetrical shadow of the collimator

[1] H. E. Howe, *Phys. Rev.*, VIII., 6, 1916, 674.

tube on the spectrograph body. The Nernst filament was placed vertically. It was used at such a distance from the slit that at its nearest position to the slit the whole of it was effective in illuminating the plate.

The graduations of the sector opening were compared and corrected with a protractor. The sector wheel ran 120 revolutions per minute, there being two openings in the wheel, the sum of the two being an angular opening equal to that given in the table.

The plates used were half of them Wratten & Wainwright Panchromatic and half Seeds Panchromatic. In one instance a Seeds Process was used with the same results. The plates were given uniform tank development. The exposures were such as to give rather faint images, necessary in order to judge accurately differences in intensity. The exposures were such, however, that with the sector running they were always longer than one minute. A plate would contain a set of exposures for the so-called zero of the experiment, the initial balance distance, and a set of exposures with the sector running, the movable lamp being placed at distances such as to make equivalent sets of exposures. The distances corresponding to the two pairs which matched on such a plate when divided the one by the other gives a quotient which is a figure of the table. With a good setting the two spectral bands balanced throughout if they balanced at all, showing that the proposition is independent of wave length.

As the sector photometer is used for spectrophotometry the two beams fall on a bi-prism in front of the slit with the result that the two beams on the plate are in juxtaposition. Because of the fact that the total reflecting prism used here had been slightly ground on its edges the two bands of the pair in this experiment were .4 mm. apart, which increased somewhat the difficulty of judging equality in blackening. The error in such judgments was probably of the order of 2 per cent. It may have been less than this. The averages for the figures of the table differ as the last two columns show by about a half per cent. from what the figure should be if the diminution in the intensity of the beam due to the sector is photographically equivalent to the diminution due to a proportionate increase in distance.

That this equality exists is certainly a coincidence. Recently Helmick[2] has shown that long exposures produce less blackening than short exposures, the total energy being the same (this being when both the short and long exposure are longer than a certain fixed time). In some rough experiments which I first made I found that the total actual intermittent exposure necessary to produce equal blackening through a 72° sector was about of the order of 12 per cent. longer than for a like continuous exposure, *i. e.*, the sector at rest. The evidence herein contained goes to show that when the beam is dimmed by increasing the distance of its source the exposure must likewise be longer by this same amount. In other words, if B_1, B_2 and B_3 are the blackenings due respectively to a certain beam, to the same beam made intermittent and to a beam of decreased intensity, all of the beams delivering equal total energy through the regulation ot the time factor, then B_2 and B_3 are less than B_1 but are equal to each other.

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THE AMERICAN ASSOCIATION OF VARIABLE STAR OBSERVERS

THE seventh annual meeting of the American Association of Variable Star Observers was held at the Harvard Observatory, Cambridge, Mass., on November 23, 1918. More than a score of the members were present and the association became formally incorporated under the laws of Massachusetts. The meeting was, without doubt, the most successful and enjoyable that has yet been held. The reports of the several committees indicated the active interest and aims of the members, and a new committee, under the chairmanship of Professor S. I. Bailey, was appointed to gather together a collection of astronomical slides which could be loaned, under proper supervision, to members who might care to lecture in their vicinity, thus tending to arouse a greater interest in astronomy and particularly variable stars.

[2] P. S. Helmick, *Phys. Rev.*, XI., 5, 1918, 372.

Several prominent authorities on variable stars were elected to honorary membership, including Miss H. S. Leavitt, of the Harvard Observatory; Professor S. A. Mitchell, director of the Leander McCormick Observatory; Professor H. C. Wilson, director of the Goodsell Observatory, and editor of *Popular Astronomy;* Mr. C. L. Brook, director of the Variable Star Section of the British Astronomical Association, England, and Professor A. Bemporard, director of the Observatory, Catania, Italy. Mr. C. E. Barnes, who has been most generous in acting as publisher for the association, was elected as the second Patron.

A pleasant feature of the meeting was the presentation to Professor E. C. Pickering of a solid gold paper knife, set with appropriate jewels, as a token of the esteem in which he is held by the association. President D. B. Pickering most graciously presented the token, in substantially the following language:

Members and friends of the A. A. V. S. O.: It is my very happy task, at this time, to act for you in the performance of a duty of true friendship and appreciation.

At the time our association was formed, seven years ago, its course was decided and its fate determined largely by the influence of one man. Whatever he may have hoped to win for science from our efforts at that time or since, can not be commensurate with the sacrifices that he has made in our behalf.

He has assisted us in everything that we have undertaken and has carefully watched our progress along every step of the way. And the manner of his so doing has been that of the big brother.

For us he has laid aside the cloak of the physicist and master of research, and has given us his hand in fellowship, has taken us into his home, seated us at his board, and been one of us.

Professor Pickering, our attempt to convey to you at this time some feeling of appreciation for the big thing you have done for us, seems very weak and inadequate: but we want you to know that with the little token we are shortly to ask you to accept, there goes to you from each and every one of us the warmest feeling of friendship and goodwill.

There is a precious stone called the alexandrite, that has the rare property of appearing green in the light of day and red under artificial light, and well symbolizes the colors of the stars at their evolutionary extremes. There is also another, called the star-sapphire, wherein nature, in a manner with which we are unfamiliar, has set a star against a background of azure. Both of these gems are mounted in this little remembrance.

The inscription reads: "Edward Charles Pickering, Director of the Harvard College Observatory, from the American Association of Variable Star Observers, November 23, 1918," and the reverse reads: "This token of appreciation is tendered to him who has done so much to promote the study of variable stars: guiding the amateur with untiring helpfulness along paths of understanding into fields of usefulness and pleasure."

Will you accept it, sir, and with it the gratitude we have tried to express.

Professor Pickering, though taken completely by surprise, responded in his usual characteristic manner and expressed his great appreciation to the association for such an expression of friendship and gratitude, and added that he had felt all along, that he and science were the ones that were being helped by the untiring efforts of the members of this association.

Mr. D. B. Pickering's address as retiring president, was a model of clearness and explicitness and dealt thoroughly with the aims and purposes of the association, what it had accomplished in the past seven years, and what it hoped to do in the future.

The climax of the meeting came at the sumptuous dinner held in the evening, at a private house near the observatory, where in the absence of the newly elected president, Mr. Campbell, acted as presiding officer and toastmaster. The after-dinner speeches, both of an astronomical and non-astronomical nature, were greatly enjoyed by all.

The newly elected officers are: *President,* H. C. Bancroft, Jr., of West Collingwood, N. J.; *Vice-president,* C. Y. McAteer, of Pittsburgh, Pa.; *Council Members for two years,* Miss A. J. Cannon, of Harvard Observatory, and Professor C. E. Furness, of Vassar College Observatory. W. T. Olcott and A. B. Burbeck continue to serve as secretary and treasurer, respectively, and Professor A. S. Young and J. J. Crane have another year to serve on the council.

For the members who could remain in Cambridge until the next day, a visit was made to the Students' Astronomical Observatory at Harvard College, where Dr. Stetson most graciously and thoroughly explained the elaborate devices that are being used there to teach astronomy to the rising generation.

The spring meeting will be held on the first Saturday in May, 1919, in East Orange, N. J., at the invitation of Mr. D. B. Pickering.

L. C.